JIG FOR SINTERING ELECTRONIC PARTS

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Abstract of **JP2002114578**

PROBLEM TO BE SOLVED: To provide an electronic parts sintering jig having long-term durability, improved by selecting the kind of metal to be used as a surface layer in order to solve the problem that the conventional jig is short of long-term durability, for example, the surface layer is peeled off from an intermediate layer because the adhesive strength between the surface layer and the intermediate layer is not sufficient. SOLUTION: This jig for sintering electronic parts comprises a base material, the intermediate layer or partially melted intermediate layer which is coated on the surface of the base material and which consists of a metal oxide containing alumina, and the zirconia - calcia - alumina - yttria surface layer or the yttria-stabilized zirconia surface layer formed on the intermediate layer or the partially melted intermediate layer. When the oxide or a composite oxide of metal is used as the surface layer, the adhesive strength between the surface layer and the (partially melted) intermediate layer is enhanced regardless of the kind of metal of the intermediate layer or partially melted intermediate layer so that the jig for sintering electronic parts, which is excellent in long-term durability such as exfoliation resistance, can be obtained.

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CLAIMS

[Claim(s)]
[Claim 1] The fixture for electronic-parts baking characterized by changing including the zirconia-calcia-alumina-yttria surface layer formed on the middle class who consists of a base material and the metallic oxide covered by this base material front face, and this middle class.
[Claim 2] The fixture for electronic-parts baking according to claim 1 with which an interlayer contains an alumina.
[Claim 3] The fixture for electronic-parts baking according to claim 1 chosen from two or more sorts of oxides chosen from the group in which the middle class contains a zirconia, calcia, an alumina, yttria, and a magnesia.
[Claim 4] The fixture for electronic-parts baking characterized by changing including the middle class who consists of a base material and the metallic oxide covered by this base material front face, and the fully-stabilized-zirconia surface layer formed on this middle class.

[Claim 5] The fixture for electronic-parts baking according to claim 4 a fully-stabilized-zirconia surface layer and whose middle class are yttria-stabilized-zirconia surface layers.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to fixtures for electronic-parts baking, such as the setter and shelf board which are used in case electronic parts, such as a dielectric, a multilayer capacitor, a ceramic condenser, a piezoelectric device, and a thermistor, are calcinated, and a sagger.
[0002]
[Description of the Prior Art] It is required that the fixture for electronic-parts baking should not react besides thermal resistance or a mechanical strength with the ceramic electronic parts to calcinate. When electronic-parts work pieces, such as a dielectric, contact the fixture for baking and react, it welds or there are troubles, like a property fall arises by presentation fluctuation of a work piece. Usually, as a base material of these fixtures for electronic-parts baking, warm strength is high and the good alumina mullite system base material of heat spalling nature is used frequently. However, in order that a reaction with an electronic-parts work piece may tend to occur and this alumina mullite system base material may prevent this reaction, the approach of covering a zirconia is adopted as the base material front face.
[0003]
[Problem(s) to be Solved by the Invention] Although the reactivity of a zirconia with a base material is low, since the difference of a coefficient of thermal expansion with this base material is large, under the operating environment which a repeat heat cycle produces, the problem of a crack arising or exfoliating is in covering of a fixture. Furthermore, as for a zirconia, the phase change from a monoclinic system to ****** happens about -1100 degree C. As a result by change of the coefficient of thermal expansion accompanying the phase transformation by the repeat heat cycle, there is a trouble that the enveloping layer of a zirconia tends to ****. In addition, in using non-fully stabilized zirconia as a surface layer, there is also a trouble that powdering accompanying a phase transformation arises.
[0004] In order to solve such a trouble, the fixture for electronic-parts baking in which the zirconia surface layer and the interlayer who consists of an alumina between base materials were made to exist is proposed. However, in this fixture for electronic-parts baking, the sintering nature of an alumina is bad, and an alumina, a zirconia surface layer, and adhesion are inadequate, it is not suitable as the middle class of a surface layer and a base material, and there is a fault that it may be unable to prevent on the level with which can be further satisfied of exfoliation. Therefore, this invention is replaced with an interlayer alumina independent [conventional], an interlayer the fixture for electronic-parts baking which has the interlayer excellent in various properties especially peeling resistance, and reinforcement, or alumina independent uses it as it is, replaces with a zirconia surface layer, and it aims at offering the fixture for electronic-parts baking which has the surface layer excellent in various properties especially peeling resistance, and reinforcement.

[0005]
[Means for Solving the Problem] This invention is the fixture for electronic-parts baking characterized by 2nd to change including the fixture for electronic-parts baking characterized by to change including the zirconia-calcia-alumina-yttria surface layer formed [1st] on a base material, the middle class who consists of the metallic oxide covered by this base material front face, and this middle class, a base material, the middle class who consists of the metallic oxide covered by this base material front face, and the fully-stabilized-zirconia surface layer formed on this middle class.
[0006] This invention is explained to a detail below. The fixture for electronic-parts baking of this invention consists of a base material-middle class-surface layer, and the zirconia-calcia-alumina-yttria or yttria stabilized zirconia which was not used is conventionally used for it as a surface layer. Although especially the middle class is not limited, the liquation middle class containing the zirconia-calcia-alumina-yttria liquation middle class who performed an alumina independent layer and baking, or an alumina-calcia-magnesia is used. The quality of the material of the base material of the fixture for electronic-parts baking concerning this invention is the same as usual, and is good, for example, an alumina system ingredient, an alumina-mullite system ingredient, an alumina-magnesia system spinel ingredient, an alumina-mullite-cordierite system ingredient, or the ingredient by these combination is used.
[0007] The middle class or the liquation middle class formed on this base material is obtained by combining the mixture of 1 or two or more kinds of metallic-oxide particles mutually with a binder, or carrying out elevated-temperature baking. As a metallic oxide which constitutes this interlayer or a liquation interlayer, there are an aluminum oxide (an alumina, aluminum 2O3), a zirconium dioxide (a zirconia, ZrO2), yttrium oxide (yttria, Y2O3), a calcium oxide (calcia, CaO), magnesium oxide (MgO, magnesia), a strontium oxide (strontia, SrO), an alumina magnesia spinel multiple oxide (it is called a "spinel oxide" aluminum 2O3, MgO, and the following), etc. 1 or two kinds or more are chosen from these. It is desirable to specifically combine an alumina independent or an alumina, and other metallic oxides, for example, the interlayer or liquation interlayer who has the property which was excellent with the combination of zirconia-calcia-alumina-yttria, and an alumina-spinel oxide-magnesia and alumina-calcia-yttria is obtained, and in being alumina independent further, the property excellent in combination with the surface layer mentioned later is discovered.
[0008] When using two or more kinds of metallic oxides, although not limited, if the content of one kind of metallic oxide exceeds 90 % of the weight, since the effectiveness of the mixed rate [especially] which uses the mixture of two or more kinds of metallic oxides decreases, it is not desirable. Although especially the particle size of the metallic oxide which constitutes this interlayer or a liquation interlayer is not limited but an interlayer or a liquation interlayer may be constituted from a metallic oxide of a random particle size, coarse grain and a particle are mixed. For example, mean particle diameter 30-500 If it mixes and the coarse grain of mum and a particle with a mean particle diameter of 0.1-10 micrometers are made to exist An opening is formed into an interlayer or a liquation interlayer with a coarse-grain metallic oxide with large porosity. The difference of the coefficient of thermal expansion between a surface layer, an interlayer, or a liquation interlayer and between an interlayer or a liquation interlayer, and a base material can be absorbed, and it can ease, and even if it uses it under the heat cycle

environment which repeats rapid heating and quenching, it can be used, without exfoliating comparatively for a long period of time. However, the amount of the coarse grain to an interlayer or the whole liquation interlayer is made into 90 or less % of the weight.

[0009] Said middle class can form in a base material front face by the spreading-thermal decomposition method, the spray method, the dip coating method, the binding method, etc. A spreading-thermal decomposition method is the approach of changing into the metallic oxide which applies metal salt water solutions, such as a nitrate of a correspondence metal, to a base material front face, and corresponds by the pyrolysis, and covering on a base material front face. A spray method is the approach of making a solvent suspend the metallic-oxide particle of a predetermined particle size, and injecting this solvent on a base material front face, and dispersing a solvent, and covering a metallic oxide on a base material front face. Moreover, a dip coating method is the approach of forming in a base material front face the solution layer which dips a base material in the solution which made the correspondence metallic oxide dissolve or suspend, and contains a metallic oxide, and drying, removing a solvent, and forming a metal oxide layer, and the binding method is an approach which a base material surface layer is made to bind while combining mutually the metallic-oxide particle which has predetermined particle size distribution using a binder. When it is hard to adjust the particle size of the metallic-oxide particle to generate and forms the interlayer of the metallic oxide which consists of the desired metallic oxide of particle size distribution, for example, above-mentioned coarse grain and an above-mentioned particle, as for a spreading-thermal decomposition method and a dip coating method, it is desirable to be based on the spray method which sprays the metallic-oxide particle of a predetermined particle size directly, or the binding method to make the metallic-oxide particle of a predetermined particle size bind.

[0010] Especially the thickness of an interlayer or a liquation interlayer is 10-200, when forming only by the particle of a metallic oxide, although not limited. mum is desirable and the thickness of the interlayer formed or a liquation interlayer can be adjusted to arbitration by taking into consideration the amount of spraying of the metal metallurgy group compound to the base material in each manufacturing method or the amount of covering of the solution of a metal metallurgy group compound, and the amount of solvents removed. As for the burning temperature of an interlayer or a liquation interlayer, it is desirable to make it temperature higher than the temperature which actually calcinates electronic parts, and to make it the fixture for electronic-parts baking of this invention not deteriorate at the time of use. Since the burning temperature of the usual electronic parts is 1200-1400 degrees C, as for interlayer burning temperature, it is desirable to consider as about 1300-1600 degrees C. In addition, after baking of an interlayer forms a surface layer, it may be performed to baking and coincidence of this surface layer, and thereby, it can reduce the count of a baking process.

[0011] Thus, a zirconia surface layer is formed on the middle class formed or the liquation middle class. Let the matter which constitutes this zirconia surface layer be the zirconia stabilized by the multiple oxide of zirconia-calcia-alumina-yttria, or yttria. In order that a surface layer may contact electronic parts and directly, it must not have a bad influence on these electronic parts, and the multiple oxide containing the zirconia or zirconia stabilized [which stabilizes and part-stabilized] with yttria, calcia, a magnesia,

etc. is used for it. A zirconia "can stabilize" ****** and the cubic which are a parent phase under a room temperature by making liquation binding material (stabilizing agent), such as yttria and a magnesia, dissolve to a zirconia, although it is monoclinic system and the phase transformation of monoclinic-system ->(- 1170 degrees C) -> tetragonal-system ->(- 2370 degrees C) -> cubic system happens with a temperature rise at a room temperature. The process of said surface layer has a spreading-thermal decomposition method, a spray method, a dip coating method, the binding method, etc. like said middle class.

[0012] Among these surface layers, although the multiple oxide of zirconia-calcia-alumina-yttria can be manufactured by the middle class's for example, the same spreading-thermal decomposition method as a case, a spray method, a dip coating method, binding method, etc., it may use processes other than this. For example, what is necessary is to change into the metallic oxide which dissolves the mixture of a zirconium-nitrate-calcium nitrate-aluminium nitrate-nitric-acid yttrium in water, prepares a metallic-oxide water solution, applies this water solution to a base material front face, and corresponds by the pyrolysis, and just to cover on a base material front face, when manufacturing with a spreading-thermal decomposition method. As for the mixed rate of zirconia-calcia-alumina-yttria, it is desirable for a zirconia to be 50% or more in consideration of reactivity with electronic parts, and it is desirable for each other oxides to contain one to 50% of the weight. Moreover, in the case of yttria stabilized zirconia, may form by calcinating the zirconia of a random particle size which added a small amount of yttria, but coarse grain and a particle are mixed like said interlayer's case. For example, mean diameters 30-500 If the zirconia coarse grain of mum and the zirconia particle of 0.1-10 micrometers of mean diameters are mixed and it is made to exist with yttria An opening is formed in a surface layer of zirconia coarse grain with large porosity. In addition to the opening organization potency by the middle class or the liquation middle class, the difference of coefficient of thermal expansion with a yttria-stabilized-zirconia surface layer, the middle class, or the liquation middle class can be more completely absorbed by the opening organization potency of a yttria-stabilized-zirconia surface layer, and it can ease. In addition, it is desirable to make coarse grain into 90 or less % of the weight to the whole also in this case.

[0013] Thus, since the component which is not in the high former of an interlayer or a liquation interlayer, and adhesion as a surface layer is being used for the fixture for electronic-parts baking of this invention manufactured, it is strongly excellent in endurance in exfoliation etc. over a long period of time. when constitute an interlayer from a metallic oxide, the liquid phase formed of liquation when melting of the part of them was carried out and it was a liquation interlayer at the time of heating baking reacts with both surface layer and base material, the adhesion force between each class and a base material is remarkably improved by this and it puts in another way, a surface layer spreads on exfoliation from a base material -- ** -- ** In addition, since it may contract in case the liquid phase solidifies and the film and a base material may deform when there are too many amounts of liquid phase, it is desirable to set up the conditions of heating baking appropriately. Furthermore, if two kinds of metallic oxides are used as a liquation interlayer, even if the sintering nature of one kind of metallic oxide is inferior, it will be complemented by the sintering nature of other metallic oxides, the sintering nature as the whole will improve, and the reinforcement as a liquation interlayer will be

improved. Moreover, by using two kinds of metallic oxides, the melting point falls from a metallic-oxide independent (the melting point of an alumina is about 2000 degrees C) case, and baking at 1300-1600 degrees C which is a desirable burning temperature becomes easy. Therefore, although the exfoliation prevention which cannot be attained substantially can be attained in the fixture for electronic-parts baking which has the interlayer who formed with one kind of metallic oxide, the interlayer who formed with one kind of metallic oxide is also contained in this invention. Endurance is improved also for the fixture for electronic-parts baking with which an affinity with the alumina recognized that an affinity with other metal components cannot use weakly conventionally the fully stabilized zirconia, especially yttria stabilized zirconia which can be used as a surface layer by this invention as an interlayer component independently is strong, and an interlayer is made as an alumina and it makes a surface layer fully stabilized zirconia over a long period of time. Furthermore, in the fixture for electronic-parts baking to which the liquation middle class and the surface layer which are one mode of this invention change from zirconia-calcia-alumina-yttria, since the presentation of the liquation middle class and a surface layer is the same, the compatibility of both layers improves, adhesion improves, the component of both layers is further spread among both layers, and it becomes easy to generate a mixolimnion, therefore the adhesion between both layers improves above more.

[0014]

[Embodiment of the Invention] Although the example about manufacture of the fixture for electronic-parts baking of this invention is indicated, this example does not limit this invention.

[0015] As example 1 base material, the silica component used the alumina-mullite base material to about 10 % of the weight. Each mixed a microparticulate zirconia (7 % of the weight), calcia (25 % of the weight), an alumina (50 % of the weight), and yttria (18 % of the weight) to homogeneity in the ball mill, added the polyvinyl alcohol which is water and a binder, and considered as the slurry. The spray coat of this slurry was carried out to said base material front face, and it dried by about 100 **. An interlayer's obtained thickness is about 100. It was mum. Subsequently, the spray coat of the mixture which mixed coarse-grain-like a zirconia (70 % of the weight), a microparticulate zirconia (15 % of the weight), calcia (8 % of the weight), an alumina (4 % of the weight), and yttria (3 % of the weight) to homogeneity in the ball mill was carried out to this middle class's front face, respectively, and it dried by about 100 ** on it. The thickness of a zirconia-calcia-alumina-yttria surface layer is about 100. It was mum. This layered product was held at 1400-1600 degrees C for 2 hours, said interlayer was changed into the liquation interlayer, and the fixture for electronic-parts baking was produced.

[0016] In order to investigate exfoliation with the surface layer of this fixture for electronic-parts baking, a liquation interlayer, and a base material, with the electric furnace, from 500 ** to 1300 degrees C, it hung for 3 hours and rapid heating was carried out, and it repeated quenching over 3 hours from 1300 degrees C to 500 ** subsequently, and the number of heat cycles to exfoliation was investigated. Consequently, 150 Exfoliation was not produced even if passed through the cycle. The result was shown in Table 1.

[0017] The fixture for electronic-parts baking is produced like an example 1 except having made two to example 5 interlayer particle alumina independent (example 2).

Furthermore, it is the mixture of the alumina (75 % of the weight) of a particle, calcia (23 % of the weight), and a magnesia (2 % of the weight) about a liquation interlayer. The fixture for electronic-parts baking is produced like an example 1 except having carried out. The fixture for electronic-parts baking is produced like an example 1 except having carried out also to (an example 3), the middle class, and a surface layer with a particle-like yttria-stabilized-zirconia independent (example 4). It is the mixture of an alumina (60 % of the weight), calcia (5 % of the weight), and yttria (35 % of the weight) about an interlayer. The fixture for electronic-parts baking was produced like the example 1 except having carried out (example 5). The thickness of an interlayer or a liquation interlayer was 150 micrometers (example 2), 150 micrometers (example 3), 50 micrometers (example 4), and 100 micrometers (example 5), respectively. Moreover, the thickness of a surface layer was 200 micrometers (example 2), 150 micrometers (example 3), 50 micrometers (example 4), and 100 micrometers (example 5), respectively. In order to investigate exfoliation with the surface layer of these fixtures for electronic-parts baking, an interlayer or a liquation interlayer, and a base material, rapid heating and quenching were repeated under the same conditions as an example 1, and the number of heat cycles to exfoliation was investigated. Consequently, 150 Exfoliation was not produced even if passed through the cycle. The result was shown in Table 1.

[0018] The fixture for electronic-parts baking was produced like the example 2 except having replaced example of comparison 1 surface layer with yttria stabilized zirconia from zirconia-calcia-alumina-yttria. The thickness of an interlayer and a surface layer was 150 micrometers and 200 micrometers, respectively. In order to investigate exfoliation with the surface layer of this fixture for electronic-parts baking, an interlayer, and a base material, rapid heating and quenching were repeated under the same conditions as an example 1, and the number of heat cycles to exfoliation was investigated. Consequently, through 16 cycle, it was generated and exfoliation was not able to be used after it by stages. The result was shown in Table 1.

[0019]

[Table 1]

実施例No.	比較例No.	中間層又は部分溶融中間層	表面層	表面層／部分溶融中間層／基材間で剥離が観察されるまでの熱サイクル数
1		ジルコニア-カルシア-アルミナ-イットリア	ジルコニア-カルシア-アルミナ-イットリア	１５０回以上
2		アルミナ	ジルコニア-カルシア-アルミナ-イットリア	１５０回以上
3		アルミナ-カルシア-マグネシア	ジルコニア-カルシア-アルミナ-イットリア	１５０回以上
4		イットリア 安定化ジルコニア	イットリア 安定化ジルコニア	１５０回以上
5		アルミナ-カルシア-イットリア	イットリア 安定化ジルコニア	１５０回以上
	1	アルミナ	イットリア 安定化ジルコニア	１６回

[0020]

[Effect of the Invention] The interlayer to whom this invention changes from the metallic oxide with which it was covered by the base material and this base material front face,

And it is the fixture for electronic-parts baking characterized by changing including the zirconia-calcia-alumina-yttria surface layer formed on this middle class (claim 1). It is desirable to use the interlayer (claim 3) chosen from two or more sorts of oxides chosen from the group which contains an alumina (claim 2) or RUKONIA, calcia, an alumina, yttria, and a magnesia as an interlayer. In this fixture for electronic-parts baking, it differs from the conventional fixture for electronic-parts baking, and the compatibility, the middle class or the liquation middle class, and the high zirconia-calcia-alumina-yttria which is adhesion when it puts in another way are used as a surface layer. Therefore, endurance is improved over a long period of time, and also in the environment of the heat cycle which repeats rapid heating and quenching, it continues considerably at a long period of time, and can be used as a fixture for electronic-parts baking. Moreover, this invention is a fixture for electronic-parts baking (claim 4) characterized by changing including the middle class who consists of a base material and the metallic oxide covered by this base material front face, and the fully-stabilized-zirconia surface layer formed on this middle class, and endurance is improved over a long period of time by using yttria stabilized zirconia with high compatibility with the middle class or the liquation middle class as a surface layer, and this fixture for electronic-parts baking also continues at a long period of time, and can use it as a fixture for electronic-parts baking. moreover, with this fixture for electronic-parts baking, if a yttria-stabilized-zirconia surface layer (claim 5) is used as a fully-stabilized-zirconia surface layer and the middle class, since both the layers that should be joined contain the same component, an affinity will be markedly alike, and will improve, and the above endurance will be acquired more.

[Translation done.]